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COORDINATED CLEAN-UP

M. B. Ettinger

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

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The title for this talk was suggested to me by the people who developed your program, and I am sure that most of the audience here is keenly aware that conservation of water quality and water quantity is an increasingly pressing national problem. One of the prerogatives of the after-dinner speaker is that he does not have to give you a lot of stuffy statistics to prove his point. However, I can give you the thing in a nut shell. We must look to a future with a relatively constant amount of water falling from the Heavens. There are going to be a lot more of us. We hope we are going to look to a future with a larger population that does more manufacturing because it enjoys more of the better things in life. We are going to have a different agricultural situation than we have now. Feeding our bigger population is going to require that we master and reinforce all the agricultural resources that we can get. We are going to have to look to a future in which we must make a dollar's worth of water supply two dollars worth of water needs. Any housewife will tell you that when you are going to make a dollar do the work of two dollars you are going to have to have a multi-functional gizmo. In the case of our dollar's worth of water we are going to have to use it over again. More of your future glasses of water are going to be second-hand water.

In shopping for a used glass of water in the future we would be well advised to adopt the tactics of a careful, used-car buyer.

First, the used-car buyer wants to know, that the car was carefully designed and planned for maximum service and multiple use. He doesn't want an automobile that was slung together hurriedly.

Secondly, he wants to know that previous users of the car have used the machine carefully and done everything they could to maintain the utility and quality of the vehicle.

Thirdly, he wants to know that the car has been carefully reconditioned, and put in shape so that it will serve his purposes well.

The parallel in water quality management is simple. Firstly, we must insist that future water usage be carefully planned to give optimum service to a multitude of users and uses, and so that it will deliver all the mileage that our total society demands.

Secondly, we must require that its quality be carefully conserved and that it shall not be used up in reckless hot-rodding.

Thirdly, we must demand that our water plant does everything it can to recondition our water so that it will be in tip-top shape when it is delivered at our faucet. A good glass of used water, like a good used car, is going to have to be planned, conserved, reconditioned, and paid for.

The good citizen is an essential component of rational water quality conservation in the future. You would not think of throwing your garbage over the back fence in the hope that the neighbors will care for it, and that the flies and odors it causes will not be too much of a nuisance to you. When you dispose of your municipal wastes

into a water course you send them downstream for the next community to worry about. You are going to have to be a good neighbor so that you will not foul your neighbor's water supply.

You are going to have to pay for this conservation at the same time you pay for schools, roads, and hospitals, and perhaps some of you are going to have a hard time in seeing why you should spend your tax dollars to protect your down-stream neighbor; but I have a good deal of faith in the basic goodness and righteousness of the United States citizen, and I think you are going to do it. After all, somebody upstream will be doing the same for you.

The good citizen is going to have to be militant about the protection of the quality and quantity of the water he uses. The chances are pretty good that there is only one water main in front of your house. If you don't like the Jones Company water, you cannot show your displeasure by signing up to take your water from the Smith Water Company; but this does not mean that you should be philosophical about this. If you get your water from a private utility, you can be very sure that they are concerned lest you demand a municipal facility. If you get your water from a municipal facility, you can be sure that they will do a maximum job of treating the water for you if you let them know that you are concerned about the quality of the water you get and are willing to pay within reason for good water.

If your water facility is having trouble in making a good glass of water for you because the stream they must use has been abused, don't be a mute, inarticulate kid; get yourself into gear and let people you voted for know how you feel.

There are a lot of technical measures that have to be developed to protect your water supply. Some of these are going to impinge on your community, your job, and even on your personal life, and I am sure that some of the people affected will consider them improper exercise of governmental powers. I might touch on the highlights of some of these measures.

Appropriate bodies are going to have to develop a rational, progressively more rigorous system of industrial zoning in terms of water resources. Some industries must have large quantities of water and be able to consume substantial amounts of water quality in order to operate efficiently. These industries are going to have to be located where the expendable water quality is available and can be used up without casting an economic blight on the region affected.

Let me illustrate my point with a few figures collected by the Federal Reserve Bank of Kansas City. At one end of the scale of industrial water use an acre-foot (about 325,000 gallons) of water consumed yields more than a quarter million dollars of added value. At the other end, the same acre-foot of water yields \$6,500. In terms of jobs, the same acre-foot of water per year supported 40 people and at the other extreme only one-half of one job resulted. In particular industries involved, there is a similar spread in the impact on water quality, because the industries that consume water are also the industries that discharge large quantities of polluted water from their operations. Now let me add that the same report estimates that the value of an acre-foot of water used in agriculture is \$50, and ^{the} agricultural acre-foot of water apparently supports ^{about} ~~that~~ one twenty-fifth of one job.

It is going to be difficult for the gentlemen in the State Chamber of Commerce to exercise restraint when they are seeking to attract new industry to an area. Nevertheless, they must refrain from promising to deliver things such as water quality that the area must reserve for more productive or more essential use. Furthermore, some state or regional authority must keep the books on the water quantity and water quality resources of an area and insist that it be allocated in terms of the best interest of the total region.

There is a venerated old recipe for hasenpfeffer; it starts off; "First, catch a rabbit." In order to protect water quality we have to have some water to begin with, and it is totally unnecessary for me to remind people in Nebraska that sometimes the rains don't come exactly the way you would like. One thing we can do is use impoundments judiciously to improve the supply of water during the periods when it doesn't rain. As soon as you get an impoundment you usually have competition for the use of the impounded water. Usually a lot of power can be generated. Furthermore, the power that can be generated can be used most effectively by the utility that sells it in the form of peaking power. This means that the hydraulic power is used to take up the biggest loads that the power system encounters. It costs a lot of money to keep a steam boiler hot and ready to turn over the generator whenever it is needed. The water behind the dam is there, and when you want it you merely open a gate and let it go through the turbine. So, whenever there is an impoundment with power possibilities you have a temptation or a strong pressure to use the impounded water in the most efficient possible way for the production

of power. In most situations the way to do this is to open the gates for a few hours in the morning, and for a few hours in the afternoon when industrial loads peak — otherwise you save the water up behind the dam. So, in the operation of impoundments put there to insure that we have water when it doesn't rain, we must not let the desire to develop the cheapest power lead us to operate the dam in such fashion that it definitely fouls up water quality. You can be sure, however, that wherever there is a dam there is a clash of a multitude of competing interests that must be carefully considered in determining the best way to operate the dam from the standpoint of all the people in the region affected.

I mentioned earlier that we are expecting more people, enough so that eventually there will be a real pressure on our agricultural capacity to produce. The West has long used irrigation, and now in the eastern part of this country there is a growing interest in the use of supplemental irrigation to increase crop production. This may mean that when the rains don't come the farmer may take his pipe and his pump and arrange to pump some water out of the river to irrigate an arid field. One of my friends made some estimates of the effect of supplemental irrigation on stream flow a few years ago. He figured that the need for supplemental irrigation was most likely when the flow in the river was relatively low. He considered the Maumee River basin in Ohio and computed that irrigating about one quarter of one per cent of the land in the basin would be enough to consume the entire flow in the river during a dry period. I can think of a number

of cities, relatively important ones, that could be dried up completely by the withdrawal of their water for irrigation of a small amount of land. Towns like Indianapolis, Indiana; Columbus, Ohio; and others have relatively small surface water resources from which they secure their water. You obviously can't wipe out a town of four-hundred thousand people to increase the yield of a few thousand acres. Agriculture must be allowed to consume surplus water resources on a rational basis, rather than letting any farmer who decides to buy a pump and some pipe tap an important surface water resource.

I recently saw a report by a prominent firm of consulting engineers who considered a watershed in Michigan near Detroit. Three points I have just tried to make stuck out rather vividly in this report. First, the watershed has a number of existing impoundments which have previously been used to supply hydraulic power in a large power network. With the development of other facilities the hydraulic power supply has now shrunk to such a piddling fraction of the total that it is no longer worthwhile for the power company to operate the hydraulic power plants. The report presented a carefully supported opinion that the dams should now be maintained and operated simply to keep a reasonably constant supply of water in the river which serves a number of communities. It was also the judgment in the report that the optimum development of the watershed could not contemplate extensive truck farming or other operation that would put a drain on the water resources during low flow. A third conclusion of the report was that the river basin development plan could not accommodate any kind of industry that requires large amounts of water, particularly if there would be reduction of either water quantity or water quality by such usage.

As the demand for water increases, the community is going to be required to do a progressively better job of collecting and treating its wastes. The practice of using one sewer to handle both storm water and sewage is going to come under increasingly stringent scrutiny. We cannot afford to bypass the sewage to the river every time there is a little rain. We are going to be forced into considering and developing separate sewers, and this is going to be a costly and uncomfortable procedure. It will tear up your streets and your pocket book. There is room for a lot more foresight in present planning of sewer systems, particularly wherever new construction is involved.

In addition, your town is going to have to see that all the sewage gets to the sewage treatment plant. The chances are pretty good that between 5% and 20% of the sewage in your town escapes treatment in one way or another and goes directly into the stream. You can easily see that it does not make sense to talk about 95% efficiency of sewage treatment if 20% of the sewage goes totally untreated. After you have got the sewage collected there is going to be a requirement for progressive upgrading in the quality of treatment applied, in order to make possible reasonable reuse of the water. Remember that your sewage, treated or untreated, will enter somebody else's water supply, and then this water is going to have to be further reconditioned so that he can use it to drink. Love thy downstream neighbor and treat your sewage.

The conservation of water quality may even impinge on your living habits in the household. For instance, in England the government

is presently showing extreme interest in the characteristics of the detergent which the housewife uses to wash her dishes. If she uses what is called "biologically soft" detergent, which means that the active organic ingredients can be destroyed by microbes, she puts an organic load in her wastes which can be assimilated in sewage treatment and in the receiving water course. If she uses "biologically hard" detergent, which means that microbes cannot consume very efficiently the organic material it contains, then this material will last almost indefinitely in the stream it enters and be a continuing nuisance. This country is not without a number of instances where detergents from upstream water use have made it almost impossible to get a glass of water which does not closely resemble a platinum-blond "beer" with a built-in head of suds. I don't think we are very close to this critical point now in most parts of the country, but the situation has been recognized in the revision of the Drinking Water Standards now being considered, and it seems reasonably clear that there will be a definite limit put on the amount of residues of the housewife's washing powder which may be present in water that is to meet the Public Health Service Drinking Water Standards.

Five or ten years ago the citizen seemed to measure his social standing in terms of the amount of chrome and horsepower of his automobile. Fortunately, this seems to be a phase which has passed, but we are now developing into the next phase, the era of the motor boat. An increasing number of people measure their social standing in terms of the length of their boats and the horsepower of the motors that

drive them. As you know, the outboard motor has been carefully designed to exhaust under water. The exhaust comes out through a hole near the propellor and is efficiently churned into the water. The exhaust contains a lot of partially oxidized oil, since outboards operate on a mixture of oil and gasoline. Worse still, most of the boats are now burning leaded gasoline, and the exhaust is likely to contain a substantial portion of the lead in the gasoline that went into the engine.

In other words, each outboard motor is an efficient device for polluting water with toxic lead and noxious-tasting partially oxidized motor oil. It won't do any particular harm if there is a lot of water and only a few boats, but if there is a small amount of water and a lot of boats with big motors you may be in trouble. So, it is not impossible that in the future you are going to find limitations on where you can operate your boat and the kind of gas that you can burn in it.

Earlier in this discussion I have overstressed perhaps the importance of economic factors in determining how our water resources will have to be used. However, I do not want to suggest that the stark economics of cost accounting can be allowed to dominate the way we are to use and enjoy our great water resources.

The naked concept of rivers and lakes dedicated to maximum service as carriers of liquid wastes from industrial and urban metabolism is inherently revolting. The citizen must have water he can drink with pleasure and confidence. He also wants his lakes and rivers to

yield beauty and joy as well as paper, steel, gasoline, and polyethylene, and he is prepared to place a high price on the great natural assets of his land.

The development and maintenance of clean water must indeed be a carefully coordinated clean-up. It involves the citizen, his pleasures, his living habits, his job, his town. It involves the State, the region, and the Nation. In the long run, the total society we live in has no option other than to clean up and to plan to keep clean at all levels. The sooner we go about this deliberately, and with long term planning, the sooner we will start to conserve and develop with true greatness our resources, our happiness, and the future well-being of our nation.